MMJ

CASE REPORT

Point of Care Cardiac Ultrasonography in three paediatric arrests

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Introduction

Point-of-Care Ultrasound (POCUS) refers to bedside ultrasonography in the clinical setting at the site of initial presentation. Few studies have reported the use of POCUS for emergency paediatric echocardiography.

Methods

This paper outlines the utility of POCUS echocardiography in three cases in Malta.

Results

Cardiac POCUS was used with utility and value on three children in the acute resuscitation setting.

Discussion

Echocardiography in children during resuscitation is feasible and it is possible to eyeball contractility and cardiac filling and assess the size of any pericardial effusions. Although the images obtained are inferior to those obtained in an echocardiography laboratory, useful information in real time can be obtained.

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Introduction

Point-of-Care Ultrasound (POCUS) refers to bedside ultrasonography in the clinical setting at the site of initial presentation. This could be a hospital emergency department, an ambulance, or a remote village.[1] Few studies have reported the use of POCUS for emergency paediatric echocardiography.[2] Malta is a small central Mediterranean island with a total population of circa half a million, and one large regional hospital.[3-4]

Methods

This paper outlines the utility of POCUS echocardiography in three cases in Malta.

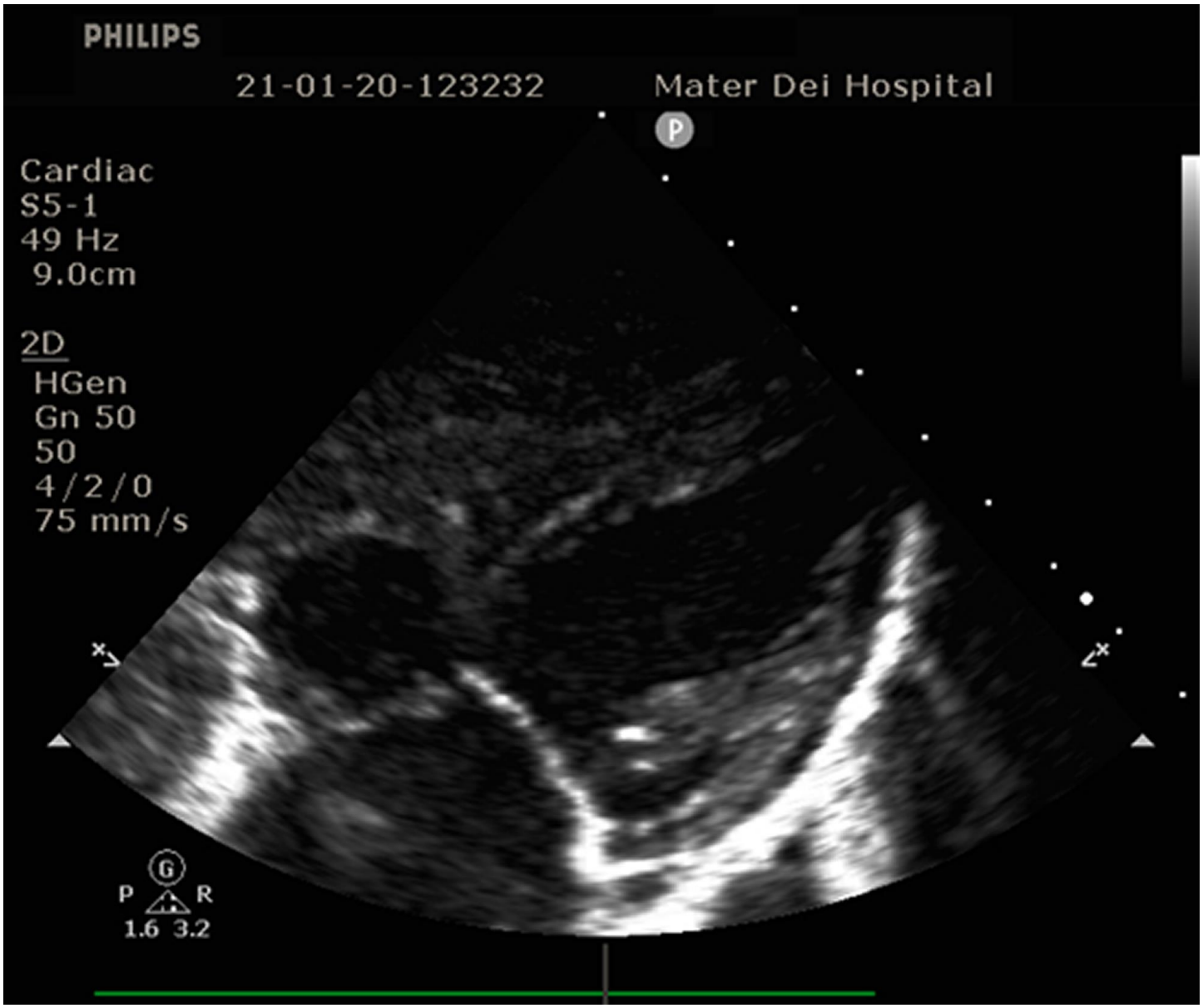
Results

Case 1

A 3-year-old male presented with a widespread petechial rash together with areas of ecchymosis extending from the forehead to the feet. These were non-blanching, along with an area of sloughing on the dorsum of the left hand and on the chin (figure 1). On initial examination he was also quiet and lethargic but responsive to commands. There was tachycardia with hypotension and rapid clinical deterioration. The working diagnosis was meningococcal septicaemia. A large bore cannula was inserted and a saline bolus was commenced. Despite this, blood pressure became unobtainable, with absent pulses and a 2nd saline bolus was administered together with intravenous ceftriaxone as per local guidelines. Over the next minutes he became bradycardic and his pulses became impalpable. Cardiac massage was commenced and the child was intubated. Adrenaline was given with some improvement of heart rate. Echocardiography was performed initially from the parasternal long axis view, later from the subcostal view. Spontaneous contrast with ventricular dilatation and very poor contractility was evident (figure 2). This indicated that the main cause for shock was reduced myocardial contractility rather than fluid depletion, prompting the decision to administer more inotropes. He was admitted to intensive care and was discharged neurologically intact after 10 days.

Figure 1: Photo of child's hand showing skin loss and petechiae

Figure 2: Subcostal view showing biventricular dilatation



Case 2

A 12-year-old girl was admitted with pulseless electrical activity despite eight doses of adrenaline given by the pre-hospital team at home. She was brought to hospital in full cardiopulmonary resuscitation (CPR). In this case a subcostal echo was performed during rhythm checks to confirm persistent cardiac standstill and demonstrate to the understandably distraught parents the lack of cardiac function and hence the futility of continuing resuscitation beyond 30 minutes at hospital.

Case 3

A 6-year-old girl was admitted in cardiac arrest following a 1-day history of high-grade fever accompanied by two episodes of vomiting. The pre-hospital team found her in cardiac arrest, and she was brought to hospital in full CPR. The initial ECG demonstrated cardiac standstill. After two doses of adrenaline, return of spontaneous circulation was established but the initial echocardiogram demonstrated poor contractility of the left ventricle. After three minutes she again went into asystole.

Resuscitation was continued for 30 minutes and echocardiography was also used to demonstrate to the parents the futility of continuing resuscitation. The post-mortem showed severe myocarditis.

Discussion

In the paediatric age group, both asphyxia and circulatory failure result in bradycardia and hypotension before deteriorating further to a pulseless cardiac arrest.[5] For this age group, the prognosis for survival to hospital discharge is much better than adults (OR of 2.29).[5] Furthermore, children may ultimately recover with excellent neurological function even after cardiac standstill.[6]

Point-of-care cardiac ultrasonography is a goal-directed bedside test that can enhance diagnostic confidence, facilitate clinical decision-making, and aid judicious management in the hemodynamically unstable child within the emergency department.[7] Diagnostic echocardiography is distinct from point of care cardiac ultrasonography as the scope of this investigation is often restricted to addressing the clinical questions raised by the patient's clinical state in order to guide immediate management decisions.[8]

Despite this, the paediatric literature regarding cardiac POCUS is sparse.[9,10,11] A small case series showed that cardiac POCUS is feasible although none of the patients in this series were in pulseless electrical activity secondary to septic shock.[12] However, an expert review has noted the utility of this type of imaging in the setting of cardiac tamponade, myocarditis and infective endocarditis.[12] However, there are no extant recommendations regarding performance of POCUS in the setting of septic shock with respect to fluid responsiveness or cardiac contractility.[13]

Interestingly, a study has shown that the level of skill required to perform cardiac POCUS to identify reversible causes of arrest, such as pericardial effusion, and to assess ventricular function and size, after only two hours of training, is almost on par (>93%) with that of paediatric echocardiographers.[14]

Point of care echocardiography can be employed to identify reversible causes of cardiac arrest as well as predict short-term outcome in these patients. In patients with a low probability for return of spontaneous circulation, the absence of spontaneous cardiac movement on echocardiography can predict a poor prospect of survival and guide the decision of resuscitation termination.[15] This was, in fact how this point of care test was applied in cases 2 and 3 above.

Conclusion

Echocardiography in children during resuscitation is feasible and while it is impossible to perform detailed calculations during cardiac massage, such as shortening fraction, it is still possible to eyeball contractility and cardiac filling and assess the size of any pericardial effusions. A small ventricle indicates the need to administer fluids while poor contractility indicates the needs for inotropic support.

Although the images obtained are inferior to those obtained in an echocardiography laboratory, useful information in real time can be obtained.

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